

## PATENT ABSTRACTS OF JAPAN

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(54) RUBBER COMPOSITION AND FUEL-TRANSPORT HOSE FOR AUTOMOBILE

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**PROMISE TO BE FULFILLED:** To obtain a rubber composition which employs an acrylic rubber as a base material, has a good fuel-impermeability, active resistance, and gasoline resistance, heat resistance, low-temperature properties, or the like, and shows an excellent electrical conductivity, and a good base for automobiles using this composition.

**EXPLANATION.** The rubber composition contains an alkyl acrylate from 10 to 15% acrylonitrile as main monomer components of an acrylic rubber and is preferably prepared by further compounding a pre-determined amount of a plasticizer having a specific SP value and molecular weight.

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**Patent numbers:**

### What are the consequences?

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## CLAIMS

## [Claim 1]

[Claim 1] The rubber constituent with which it is the rubber constituent which uses as a base material styrene rubber used for an automotive fuel transportation hose, and said styrene rubber is characterized by carrying out copolymerization of styrene alkyl acrylate, 10 - 15% of the weight of styrene/acrylate, and the double bond content and monomer of an initial component.

[Claim 2] The rubber constituent according to claim 1 characterized by said alkyl alkyl acrylate being methoxy alkyl acrylate (MMA).

[Claim 3] A rubber constituent given in either clause 1 in which the plasticizer whose SP (softening point) value is 8.8 or more, and whose molecular weight is 550 or less is characterized by carrying out 15-75 weight content addition to the base material 100 weight portion of said rubber constituent, in clause 1.

[Claim 4] The rubber constituent according to claim 3 characterized by said plasticizer corresponding to any one or more of (1) - (3).

(1) SP value of a plasticizer is 9.0 or more.

(2) The molecular weight of a plasticizer is 450 or less.

(3) The addition of a plasticizer is 1 - 30 weight percent to the base material 100 weight portion.

[Claim 5] The rubber constituent according to claim 1 to 4 characterized by said rubber constituent corresponding to (3) and/or (4).

(3) The solvent solubility value of a rubber constituent is 108 or less (min-max).

(4) The degree of hardness (the durometer type A of JIS K6263) of a rubber constituent is in the range of 45 - 75 degrees.

[Claim 6] The automotive fuel transportation hose which is a base using a rubber constituent according to claim 1 to 5, and is characterized by corresponding to either of (7) - (9).

(7) The monolayer hose using the above-mentioned rubber constituent.

(8) The double layer hose which uses the above-mentioned rubber constituent for the inner layer and the outer layer through the splitting yarn layer.

(9) The double layer hose which uses for the inner layer other predetermined rubber ingredients which were excellent in permeability or ozone resistance without passing through a splitting yarn layer when using the above-mentioned rubber constituent for the outer layer.

[Embodiment description]

## \* SUMMARY \*

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## ON LAMINA DESCRIPTION

[Detailed Description of the Invention]

[0001]

[Field of the invention] About a rubber composition used in automotive fuel transportation hose, this invention is the hose which secures properties, such as a high temperature performance, by the still more detailed shape and cross configuration, and refers to the automotive fuel transportation hose in which the conductivity required of fuel impermeability on a fired automotive fuel transportation hose is also achieved, and the rubber composition used for this.

[0002]

[Description of the Prior Art] Also in domestic and foreign, the so-called SHEET regulation in the U.S. and regulation of the fuel transparency from the same automobile age A.F. (VVO), and are carried out. As everyone knows, since the introduction of the fuel transportation hose to the fuel permeability hose to automobile is very high, the hose is demanded in the fuel transportation hose.

[0003]

[0004] Conventionally, in our country, in the fuel hose used for the so-called liquid hose, such as a fired client in the fuel line of an automobile, and a rubber client, although the hose referred to as among FRM (fluororubber) which shows the fuel impermeability which was excellent in the most type of environment of our vehicle is progressing to the fuel hose hose which has a gasolene oil supply port and a gas tank, and the breathing pipe hose and evaporative hose which constitute the so-called vapor line (universal-purpose NBR (acrylonitrile-butadiene RUBBER), and NBR and PVC (polyvinyl chloride material) of NBR and PVC (polyvinyl chloride) are used.

[0005]

[0006] The specifications which need more understood, such as FRM, and polyamide resin, a fluororubber, the hose layer as a filter mesh layer or an evaporative layer in the U.S. by which SHEET regulation is already carried out, and, on the other hand, used NBR PVC, ECU (epichlorohydrin rubber), (EVA) (vinyl acetate polyethylene rubber), etc. for the outer layer is common now.

[0007]

[0008] In the hose by the invention, however, by the specification of the above composition after over hose in our country, a breathing pipe hose, and an evaporative hose, the fuel impermeability which suit, the above-mentioned diaphragm regulation of no operation, which is not required.

[0009]

[0010] moreover, if it be the filter mesh hose and the transportation hose which used FRM and resin (rubber) for the inner layer, or in the U.S., although the fuel impermeability which clear regulation is impossible, it is very easy, and the manufacturing approach becomes complicated, in case addition corresponding with outer layer material take the lead chemical hose and processing hose and the hose using FRM with the evaporative FRM and fluororubber he prevents not a bellows configuration from the reduced poverty, there be a difficulty of \*\*

[0011]

[0012] Furthermore, from identification of static electricity resulting from a flow of the gasolene at the hose of oil supply and discharge vibration etc. A spark occurs by contact of the metal oil supply gun at the hose of oil supply, and ignites to a gasolene. Although it is supposed that permeability of spraying with be prepared on permeability, conductivity will be given to a filter mesh hose and a breathing pipe hose if it is set at the volume resistivity value of  $10^8$  or less  $\Omega \cdot \text{cm}$ , and the above-mentioned etc. friction.

will be performed. Since electric resistance is large, PVM and resin material are essentially difficult to give sufficient number, mass.

[0006] The inventor-in-the-application person has already proposed the automotive fuel transportation hose using the processing rubber composition and the processing which use NBR, PVC, as a base material in the vicinity of such a conventional technique in the specification attached to the application of Japanese Patent Application No. (in 182465) [1 to 3], and the specification attached to the application of Japanese Patent Application No. (in 182466) [1 to 3].

[0007] However, when the workshop was changed further, with the fifty year's data, there were needs which change the fitting location to a gas tank in the direction of the lower part, and since it was noted and the lower inside always contacts a gasoline, the need of having poor gasoline-proof nature has consideration came out in recent years. Moreover, as an inspection item, there are needs to the thermal resistance which was excellent since the part was used in an engine room. Furthermore, since the stress concentration which may degrade rubber material is added by the gasoline, stress-proof nature is also required. At least such a price, the rubber composition which uses the above-mentioned NBR and PVC as a base material cannot necessarily be said to be perfectness.

[0008] Thus, this invention solves the technical problem which should be solved to offer the rubber composition which, it not only meets the needs of said conventional techniques, but set (1) was alike and (2) and was further gasoline in points, such as poor gasoline-proof nature, thermal resistance, stress-proof nature, etc. are simultaneously excellent. And a broader one the invention in this application was completed for there being a field of the presentation which not only the technical problem of this invention, and a contribution formula is the presence in which the monomer proportions and combination formula of an additive are considered.

[0009]

[Means for Solving the Problem] (Configuration of the 1st invention) The configuration of the 1st invention (invention according to claim 1) of this application for solving the above-mentioned technical problem is a rubber composition which uses as a base material acrylic rubber used for an automotive fuel transportation hose, and said acrylic rubber is the rubber composition to which copolymerization of about 0.1 to 99.9 wt % of the weight of acrylonitrile (AN), and the bridge structure and monomer of an ester compound is caused out.

[0010] (Configuration of the 2nd invention) The configuration of the 2nd invention (invention according to claim 2) of this application for solving the above-mentioned technical problem is a rubber composition where alkyl alkyl acrylate concerning said 1st invention is arbitrary alkyl acrylate (MEA).

[0011] (Configuration of the 3rd invention) The configuration of the 3rd invention (invention according to claim 3) of this application for solving the above-mentioned technical problem is a rubber composition with which 1.0 to 25 weight section addition of the plasticizer where BP (benzothiazyl disulfide) rubber is 8.8 or more, and whose molecular weight is 550 or less is caused out to the base material (100 weight section) of the rubber composition concerning said 1st invention, in 1st invention.

[0012] (Configuration of the 4th invention) The configuration of the 4th invention (invention according to claim 4) of this application for solving the above-mentioned technical problem is a rubber composition where the plasticizer concerning said 1st invention corresponds to any one or more of (1) to (3).

(1) BP rubber of a plasticizer at 9.0 or more

(2) The molecular weight of a plasticizer at 450 or less,

(3) The addition of a plasticizer at 1.0 to 20 weight section in the base material 100 weight section.

[0013] (Configuration of the 5th invention) The configuration of the 5th invention (invention according to claim 5) of this application for solving the above-mentioned technical problem is a rubber composition with which the rubber composition concerning said 1st invention, the 4th invention, corresponds to (1) and/or (2).

(1) The volume resistivity value of a rubber composition is 10<sup>10</sup> or less ohm-cm,





[0042] [Rubber constituent] The rubber constituent constituting the invention uses as a base material styrene rubber to which copolymerization of alkyl allyl acrylate, i.e., 15% of the weight of ACR, and the bridge formation rate measured at an initial composition was carried out.

[0043] Although what is necessary is for there to be no special limitation about the content of styrene in the closed-chain rubber of a bridge formation rate measured, and even to decide it insofar that it will be economical, the epoxy bridge formation rate measured mostly used those styrene rubber use by said model 1 to 2% of the weight preferably, for example. Moreover, in this case, since a vulcanizing agent, cross-linking agent, inelastic vulcanization, periodic vulcanization, etc. are possible, and a cure needs to perform secondary vulcanization.

[0044] Although the rate of alkyl allyl acrylate is not limited, large MMA or large EHA of the same temperature-performance characteristic characteristic to a rubber nonchamber, and diverse MMA are desirable. Moreover, [0045] in the case of using MMA and EHA together so that the total quantity may become 10 - 90 % of the weight, for example, 1, 100 or more kind of alkyl allyl acrylate can also be used insofar to that the total quantity may become 80 - 90 % of the weight. As long as the above-mentioned composition component predominates it kept as styrene rubber, at least conventional use of the styrene rubber constituent of other types may be carried out at a time.

[0046] It is desirable that 1-2% weight portion addition of the plasticizer whose SH value is 8.8 or more and whose molecular weight is 150 or less is carried out to the base material 100 weight portion into the rubber constituent to the rubber constituent which uses the above-mentioned styrene rubber as a base material. It is especially desirable that it is 1.5 - 20 weight portion about the addition of a plasticizer that it is 150 or less about the molecular weight of a plasticizer and it is 9.0 or more about SH value of a plasticizer at the base material 100 weight portion.

[0047] As a plasticizer used suitably, although other ester systems plasticizer, such as "ADOLKA" (trade name) by the Asahi classification company and "ADOLKA" (trade name) by the Nippon chemical, for example, as long as it corresponds to the above-mentioned conditions, it is not limited to these.

[0048] It is desirable to make the volume resistivity value less than 10<sup>10</sup> or less ohm-cm, and/or to make the degree of hardness (the Shore type A or JIS K6253) of a rubber constituent use the range of 55 - 75 degrees by balance with addition of said plasticizer by blending CR with the rubber constituent group, or the other hand. Although the findings of CR cannot be uniformly specified since they change corresponding to balance with the addition of a plasticizer, the case of CR to be used, they can be made into 20 - 100 weight portion added to the base material 100 weight portion as an example. Although there is no special limitation in the class of CR, it is necessary to balance many of other physical properties in the range which does not weaken the electric conduction effectiveness of this base material. However, if required, combination of electric conduction agents other than CR which does not weaken impermeability, is also possible.

[0049] Various well-known additives, such as a vulcanizing agent, a vulcanization accelerator, a white holding agent, and an antioxidant, can be blended with a rubber constituent besides the above. Though it does not act or properly acts to improvement of the effect on fuel impermeability, a low temperature performance, conductivity, etc. which is not desirable, as for white holding agents, such as a silica and a carbon nanotube, it is desirable to carry out 0.5 - 10 weight portion extent to the base material 100 weight portion.

[0050] The above-mentioned rubber constituent with a property suitable as fuel flow inner layer material, such as, the above-mentioned fuel impermeability, and other good features, conductivity, heat of slow heat transfer resistance, wearability, and a property suitable as fuel flow inner layer material, rubber resin, transition. The [intermediate fuel transportation layer] constitutes a fuel transportation flow which can be used as a component of the part of the activation of the intermediate fuel transportation flow of a 10-1000 degrees or higher layer structure can be considered as various configurations like (1) - (9) of the 1st or 2nd or 3rd or 4th or 5th or 6th or 7th or 8th or 9th or 10th or 11th or 12th or 13th or 14th or 15th or 16th or 17th or 18th or 19th or 20th or 21st or 22nd or 23rd or 24th or 25th or 26th or 27th or 28th or 29th or 30th or 31st or 32nd or 33rd or 34th or 35th or 36th or 37th or 38th or 39th or 40th or 41st or 42nd or 43rd or 44th or 45th or 46th or 47th or 48th or 49th or 50th or 51st or 52nd or 53rd or 54th or 55th or 56th or 57th or 58th or 59th or 60th or 61st or 62nd or 63rd or 64th or 65th or 66th or 67th or 68th or 69th or 70th or 71st or 72nd or 73rd or 74th or 75th or 76th or 77th or 78th or 79th or 80th or 81st or 82nd or 83rd or 84th or 85th or 86th or 87th or 88th or 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in these cases

[0040] In above (7) in the case of configuration of (9), the case of spacing part or the configuration of the surface of a spring yarn may be the case of forming a spacing yarn layer (between of the two of volume of a shade column, a non-layer, or a double layer and a middle rubber layer etc.) and an external structure, as other predetermined rubber ingredients thereof is nontheroplastic in some instances. In (9), the blend rubber (BR) of epichlorohydrin rubber (EPC), chlorosulfonated polyethylene rubber (CSM), acrylonitrile-butadiene rubber (NBR), chloride blend rubber (NBR-PVC), acrylonitrile-butadiene rubber, and styrene-propylene-diene copolymer rubber of 3 years can be mentioned.

[0041] Although it is set up initially about the thick configuration of the lower layer of a hose, and an outer layer corresponding to the total thickness of a hose, the level of fuel impermeability needed, and many engine performance of others of a hose, its outer layers may preferably be 1/2 or more thickness of the hose total thickness.

[0042] In manufacture of an automotive fuel transportation hose, the usual extrusion-molding method and the injection molding method are available. Moreover, there is an advantage offered in so that the rubber composition containing this invention is equipped with sufficient resistance to permanent set in fatigue stress, and it can perform the so-called gas volume contraction of 0% no residual stress if it is the final hose of a major diameter.

[0043] Although the automotive fuel transportation hose containing the 9th invention can be used for the various applications as a fuel hose whose function is especially suitable for the use as a filler such hose, the handling pipe hose of a vapor line, or an evaporator hose.

[0044]

[Example] (Composition formula of an unsulfonated rubber composition) is used to prepare the test piece for evaluation concerning each example of examples 1-7 and the examples 1-10 of a composition mentioned in Table 1-3 of a test, respectively. The following basic composition 1 whose following parts (composition 1, NBR or BR, and PVC whose acrylic rubber or a polymer are polystyrene, and the following parts (composition 3 whose ECR is a polymer are followed. And in the predetermined example shown in each table, the white balancing agent was identical and each composition formula of the 1 composition concerning each example was set up.

[0045] Basic composition 1 polymer 100 weight sections styrene acid One weight section triethanol One weight section carbon black (CB) A white balancing agent Various processing aid One weight section vulcanizing agent Various vulcanization accelerators This basic composition 1 is a thing applicable to examples 1-7 and the examples 3-10 of a composition. \*\*\* .. with the above mentioned "polymer"

While using the acrylic ester of the mass shown in the applicable column of each table, and an amount, use acrylic rubber which is in the column of AIT showing an applicable criterion is present or not

[0046] Basic composition 2 polymer A 100 weight sections zinc oxide Five weight sections stearic acid One weight section antioxidant Two weight sections carbon black (CB) A white balancing agent Various vulcanization accelerators The 1.5 weight sections antioxidant system vulcanization accelerators The 1.5 weight sections.

[0047] The basic composition 2 corresponds to the examples 2-4 of a composition, and the above-mentioned "polymer" is BR which amount of AIT is 50 % of the weight, NBR and PVC which amount 10% of the weight of PVC in an example 3 of a composition in NBR whose amount of AIT is 40 % of the weight, and BRP-PVC whose amount 10% of the weight of PVC in the example 4 of a composition to NBR whose amount of AIT is 16 % of the weight in the example 5 of a composition.

[0048] Basic composition 3 polymer 100 weight sections magnesium oxide Three weight sections calcium hydroxide 5-6 weight sections carbon black (CB) 15 weight sections.

[0049] The basic composition 3 corresponds to the example 1 of a composition, and the above-mentioned "polymer" is BR and ECR (Q grade master) by Sumitomo 3M which is the polylol vulcanizing agent (internal flow) (RBR) whose amount of AIT is 0 %.

[0050] Next, although such table is explained collectively as a plasticizer - example 1-3, 7, the examples 2 and 3 of a composition, and 5, the "AITER A score RS 107 grade owner" by Asahi Soda



Kogyo K.K. at 7 and 10 in the example 6, the "AIBIKA sheet RS 345 (trade name)" by Asahi Denko Kagaku K.K. DGA was used for the example 8 of a comparison for DWF for the example 9 of a comparison at the example 4 of a comparison in the pH (weight number or equivalent polymer 10% weight content) one which shows the "AIBIKA sheet RS 345 (trade name)" by Asahi Denko Kagaku K.K. in a table, respectively. SP value and molecular weight of these materials are also collectively shown in a table.

[0051] Next, in CB, the "ionomer HD 244 N 335 (trade name)" by Shion Ceram Corp. was used as "PE" or "HA" according to the content of the carbon grade of these tanks in the test which shows the "ionomer HD 244 N 335 (trade name)" by Shion Ceram Corp. but as "HD" for the C stroke SD (trade name)" by Iwata Carbon Co., Ltd. in a table, respectively.

[0052] Furthermore, as the example of a comparison is shown in a table, it is shown that as "tetra", hydrocarbon of the theme "the mixture THCN vapor (trade name)" was started use.

[0053] Moreover, although the basic combination 1 - the basic combination 1 or a polymer additive, as the combination of the basic combination 1 The "new grade 645 (trade name)" made from Unisolv Chem Co. as an add-on of the basic combination 2, "G200000 X (trade name)" or "the new for line SD (trade name)" by the chemical chemistry company As a processing aid of the basic combination 1, "resinoid 101 (trade name)" by the chemical chemistry company As a processing aid of the basic combination 2, "Cao 2 (trade name)" by the chemical chemistry company was used for "crosslinker MACHU 8110 (trade name)" by the chemical chemistry company as a carbon hydride of the basic combination 3, respectively.

[0054] Furthermore, although the releasing agent used concerning the basic combination 1 is shown in Table 1, 1 "Cao 2 (trade name)" by DENSO KAGAKU KOTOYO K.K., whose "resinoid" is an emulsion system vulcanizing agent is used, having used "PAL knock Ad 6 (trade name)" by the Choshi Indeko Chemical Industrial Company which is the emulsion system vulcanizing agent, or "HMAU 2F (trade name)" by Kao Corp. it shows "resinoid" shows that the "new grade 645 (trade name)" by Nippon Oil & Fat Co., Ltd. which is a peroxide system vulcanizing agent, or "the peroxide (trade name)" by the chemical chemistry company was used. As a release system vulcanization-acceleration agent concerning the basic combination 2, company "Nucleator CZ 3 (trade name)" was used as a sulfonamide system vulcanization acceleration using Choshi Shokko Chemical "Nucleator FI-C (trade name)".

[0055] The rubber composition which is not introduced concerning each above-mentioned example is treated with a laboratory mixer and an opening roll according to the combination formula concerning each example. Preparation of the test piece for evaluation (these rubber compositions - hot blast vulcanization for example 1, and the example 1 of a comparison - the processing for 180 degree, 1/3 minute - 1 of 10, 160 degree Cut heat of press cure for 180 degree/24.45 minutes) The examples 2-4 of a comparison were fabricated with the processing for 180 degree/10 minutes in the shape of a sheet by the thickness of 1mm, and the test piece for evaluation of the shape of a sheet concerning each example was prepared.

[0056] (Evaluation of initial physical properties) the test piece for evaluation concerning each example - using - AIB K - containing in 4251 and 4253, (MPa, elongation (%), and hardness (shoremeter type A) were evaluated in tensile strength at initial physical properties. The result is shown in Table 1, 1. About these initial physical properties, 10 or more MPa and elongation are considered that it is determined that hardness (Sh) is 50-70 the tensile strength 250% or more.

[0057] (Evaluation of gas permeability) CB using the so-called "I and C" gas test using the test piece for evaluation of each example - the transition 1 (molecules cm<sup>2</sup> mm/cm<sup>2</sup>h) was measured and low permeability gas permeability. It is the approach that one side of a test piece is referred to as being connected in a gas test here by the "CB" methods" having a gas test in the form of a permeation cup (molecules cm<sup>2</sup> mm/cm<sup>2</sup>h), ending opening (aperture area 1cm<sup>2</sup>) of a cup with the test piece. The evaluation of the shape of a sheet of thickness 1mm), and making the whole surface to a permeation. [0058] Specifically it is in the condition where held the 1000g pressure in the cup as permeation that challenge connection (one side) for 120 days in particular, and it is used as initial value (1000g were

positive [\*\*\*\*\*] and say [every] weight [it's about this positive, (mg)] is measured and stored. Next, the degree [transmission] [one side] for C's days is performed in this location, and it is every where say weight [W] and instead that, (mg) is measured and said transmission coefficient is computed by the formula called transmission coefficient  $w(W)/w(1/32)$ . Although the measured transmission coefficient is shown in each table, it is thought that it is desirable at the transmission coefficient that it is 40 or less.

[1006] (Evaluation of a low temperature performance) About the test piece for evaluation concerning each example shown in Table 1-3, it is 40%. By the cold shock endurance test specified in JIS Z 3254, low-temperature-continuous temperature (degree C) was measured and the result was shown in Table 1-3. It is thought that it is desirable at low temperature-continuous temperature that it is below -40 degree.

[1007] (Evaluation of volume resistance) About the test piece for evaluation concerning each example shown in Table 1-3, it is 100. According to J 991, the test method which was applied voltage in 1-100V measured the volume-resistance value (ohm-cm), and the result was shown in Table 1-3 with it. It is thought that it is desirable as a volume-resistance value that they are 100 or less other case.

[1008] (Heat resistance evaluation) About the test piece for evaluation concerning each example shown in Table 1-3, the elongation change after 120-degree temperature of C's 98 hours (mg) was measured, and the result was shown in Table 1-3. It is thought that it is desirable at an elongation change that it is less than -10%.

[1009] (Evaluation of fuel oil-proof property) About the test piece for evaluation concerning each example shown in Table 1-3, the volume change (%) after being immersed in the so-called "Fuel" at the conditions of 50 degree C's 48 hours was measured, and the result was shown in Table 1-3. It is thought that it is desirable as a volume change that it is 30% or less.

[1010] (Evaluation of some gas-proof property) About the test piece after carrying out two-cycle immersion on the conditions of 40-degree C's 70 hours at the above "Fuel" which contains 2.5% of the weight of heavy paraffin about the test piece for evaluation concerning each example shown in Table 1-3, it is evaluated whether there would be any abnormalities, such as hardening and softening, and the result was shown in Table 1-3. That that "O.K." was written wrote abnormality nothing and "NG" that " wrote together the contents of the abnormality with abnormalities. The thing with abnormality it being "with no abnormalities" cannot be overemphasized.

[1011] (Evaluation of carbon-proof property) About the test piece after being immersed in the above "Fuel" containing the diisobutylmethylbenzene of 0.05% (mg/L) at the conditions of 50 degree C's 72 hours about the test piece for evaluation concerning each example shown in Table 1-3, it is evaluated whether there would be any abnormalities, such as hardening and softening, and the result was shown in Table 1-3. That that "O.K." was written wrote abnormality nothing and "NG" that " wrote together the contents of the abnormality with abnormalities. The thing with abnormality it being "with no abnormalities" cannot be overemphasized.

[1012] (Evaluation of surface resistance) About the test piece for evaluation concerning each example shown in Table 1-3 After performing pretreatment referred to as preventing the vacuum drying of 40 degree C's 48 hours after being immersed in "Fuel" on the conditions of 40-degree C's 48 hours, the test piece in the condition of having made it elongating 40% was exposed in the test of the concentration of the ozone of 40-degree C's and 50pphm for 144 hours, it observed whether there would be any generating of a crack, and the result was shown in Table 1-3. That "O.K." was written shows that there was no generating of a crack, and, of course, this is desirable.

[1013] (Other evaluation) About the test piece for evaluation concerning each example shown in Table 1-3, the condition as the break face of a sheet after leaving it for one week in ordinary temperature was observed after vulcanization, and the resistance of bleeding was investigated. That in which the thing was not bleeding was "O.K." and bleeding was indicated in the table as "NG."

[1014] Moreover, it judged synthetically whether there would be any problem in workability by sharpness and roll workability, and twice examined means them. The test piece for evaluation concerning each example shown in Table 1-3. That in which what does not have a problem in workability was





